INSTRUCTION MANUAL

MODEL # BAP-10-40

SERIAL # 6-12-1666

UNIVERSAL VOLTRONICS CORPORATION
17 SOUTH LEXINGTON AVENUE, WHITE PLAINS, N.Y. ● WHITE PLAINS 9-3883

HIGH VOLTAGE LEADERSHIP

'165

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SHIPPING DAMAGE CLAIM PROCEDURE

It has been long recognized that a serious problem exists on the shipment of electronic equipment. We have attempted to design and manufacture our products so as to minimize this shipping damage and at the same time remain competitive. In order to better service to those customers who have had shipping damages we are covered by a Transportation Floater with the Aetna Insurance Company of Hartford, Conn. The following is our suggested procedure in the event you encounter shipping damage.

1. Notify the carrier immediately of the damage and communicate to him our Aetna Policy Number #1M 173696.

2. Notify UVC immediately with photographs or sketches and reasonable estimates of the expected repair costs.

3. The carrier should assume responsibility for the costs or he should disclaim the liability.

4. We will wait five (5) days before notifying our Insurance Company after we have received notification from you of the shipping damage.

5. In the event the carrier does not acknowledge the claim or its disposition we will proceed to advise our Insurance Company to pay the claim.

If upon receipt of damaged equipment you have any questions as to procedure please do not hesitate to call us collect.

UNIVERSAL VOLTRONICS CORPORATION

OCTOBER 5, 1965

June 1966

UNIVERSAL VOLTRONICS CORPORATION
17 SOUTH LEXINGTON AVENUE, WHITE PLAINS N.Y. • WHITE PLAINS 9 3688

OPERATING INSTRUCTIONS FOR PORTABLE HIGH VOLTAGE DC POWER SUPPLIES - BAP (-3) SERIES

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1. SERVICE AND WARRANTY POLICY

A. SHIPPING DAMAGE:

The Power Supply should be inspected and tested immediately upon arrival. In the event, that the unit fails to operate properly or is damaged in any way, the carrier should be notified at once. When the claim agent has inspected the shipment and prepared a report of damage, a copy of this report should be sent to us. At that time we will advise you concerning the repair or replacement of the Power Supply

B. SERVICE AND INFORMATION:

All questions concerning the operation or malfunctioning of this instrument should be directed to our representative in your immediate area. If there is no representation in your area, then contact the factory directly.

NOTE: INCLUDE MODEL AND SERIAL NUMBER IN ALL CORRESPONDENCE CONCERNING THIS POWER SUPPLY. WITHOUT THIS INFORMATION WE WILL NOT BE ABLE TO GIVE YOU PROMPT SERVICE.

If the shipment should be returned to the factory, we will send you a Shipping Release and a Tag which should be filled out and affixed to the unit. DO NOT SHIP A UNIT TO THE FACTORY WITHOUT THIS TAG, unless specific authorization has been received to do so.

C. SHIPMENTS

All shipment to UVC must be prepaid unless we authorize to the contrary. The Power Supply should be wrapped in heavy paper and packed in the original container or a wooden box with shock absorbent material on all sides. DO NOT SHIP THE UNIT WITH OIL.

Make certain all tubes, if any, are removed and shipped separately. All movable objects such as tube plate caps,solenoids,etc. should be fastened securely.

Please return instructions manual with unit to be repaired.

D. WARRANTY:

This high voltage Power Supply is warranteed by the Universal Voltronics Corporation to be free from defects in material and workmanship. Our obligation to the original purchaser under the warranty is limited to servicing the instrument and replacing defective parts which the equipment is returned, prepaid, to the factory with the exception of tubes on which there is only the manufacturers' guarantee. The guarantee is valid only if the instrument has not been abused mechanically, and the operational limitations prescribed in the instruction manual have been adhered to.

The period of warranty is one year after the date of delivery of the instrument to the original purchaser.
The removal of the serial plate, or defects caused by improper operating conditions, accidents, misuse or negligence will void the warranty.

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III. OPERATING INSTRUCTIONS

A) PRELIMINARY SETUP:

The power supply is portable and hence final operating location and mounting is not critical. It can operate in any position. The equipment has been provided with a 3-wire input plug with the third wire being ground. It is mandatory that the power supply be operated with a ground connection. If a 3-wire outlet is not available in the laboratory or test area, then run a ground jumper to the stud on the chassis rear.

B) POLARITY SETTING:

These adjustments should be made with the line cord disconnected from the mains. There are two adjustments that are required in order to set for the desired output polarity. The first adjustment is the setting of the power pack chassis. Lay the cabinet on its side and remove the screws that hold the chassis bottom cover plate. There is a permanent connection of the output cable to the center terminal which is the junction of the resistor and a high voltage termination. The two leads from the power supply are respectively labelled positive and negative. In order to operate with positive output, connect the positive lead to the high voltage terminal and the negative lead to ground. In order to operate in the opposite polarity proceed in the opposite fashion. The terminations are of a rapid disconnect type.

Replace the bottom cover plate.

The next step is to set the meter polarity selector switch located on the front panel between the two meters to correspond to the polarity set in the high voltage compartment. This front panel switch only sets the polarity of the meters. It has been located on the front panel as an added convenience to the operator as it indicates the polarity under which the equipment is operating. If a mistake is made in either the high voltage compartment or on the front panel, the meters will read down scale. There is no danger of damage as the meters are protected.

CAUTION: DO NOT OPERATE WITH BOTTOM COVER PLATE NOT IN PLACE.

C) TURN-ON:

The operation of the equipment is straightforward. Throw "Main" toggle switch to the On position. Set "Voltage Control" T-1 to zero. This control is interlocked so that no high voltage can be turned on with the control off zero. The operator should be alert that zero start is required.

Depress the "High Voltage On" pushbutton. The red "High Voltage On" light should be illuminated. If it is not, then the voltage control is not at zero.

To turn the equipment off, the operator should depress the "High Voltage Off" pushbutton. Throwing the "Main" toggle switch to the Off position will also turn high voltage off.

D) OVERLOAD - RESET:

An overload relay K-1 has been included to protect the load and the power supply against severe short circuits. This relay is in series with the low end lead in the high voltage circuit. In effect, this relay senses true output current. In case of an overload due to a short circuit, the current flowing through the relay coil (K-1) will activate relay K-2 which, in turn, will disable primary power. The pilot light "Overload" will shine.

In order to reset, the operator must depress the "High Voltage Off-Reset" pushbutton. This will release the locking relay K-2. The next step is to set the output voltage control to zero and depress the "High Voltage On" pushbutton. The operation will be per the Turn-On steps above. If, for any reason, the output fault has not been cleared, then the overload will continue to trip out.

E) FUSES:

A fuse has been included in series with the "Main" line (labelled "Main") and is located on the front panel. Also included is a fuse in series with the Primary of the high voltage transformer, also front panel mounted (labelled "Primary"). These fuses act as backup protection for the overload relay in case of failure. The overload relay is the major protective device with fuses being used for added reliability. Fuse values are given on the wiring diagram.

IV. THEORY OF OPERATION (See schematic in rear.)

This is the straightforward, well-known locking circuit. Power appears at switch S-2 (High Voltage On) after the main toggle switch is thrown. Depressing this "High Voltage On" switch allows power to flow through the interlock switch S-4 (assumed to be closed) and energizing relay K-3 through wire #20. K-3 pulls in and locks in across the line by means of its own contacts 3A. This, therefore, requires that S-2 only be of the momentary pushbutton type. After the relay pulls in, power is available at the "Voltage Control" T-1 and the pilot light I-2, "High Voltage On", is illuminated. By depressing the "High Voltage Off" pushbutton S-1, the operator momentarily interrupts power to relay K-3 which then drops out. It releases its contacts 3A so that when S-1, the "High Voltage Off" pushbutton is released, K-3 is dropped out and stays dropped out.

B) OVERLOAD-RESET CIRCUIT:

The action of the overload circuit is also straightforward. In the event of an overload, relay K-1 pulls in momentarily closing its contacts 1A. These contacts are in parallel with contacts 2A of relay K-2. This overload therefore actuates and locks in K-2 through its contacts 2A, while simultaneously opening up contacts 2B. Contacts 2B opening will instantaneously disable primary power. Note that simultaneously, the "Overload" light I-1 is illuminated as it is in parallel with the holding relay coil K-2. This circuit stays locked until such time as the "High Voltage Off-Reset" pushbutton is depressed. This then disables the relay K-2 and allows the operation to proceed per previous discussions.

It is important to note that the overload relay K-2 pull-in is a momentary one to initiate the locking action. The instant that primary power is disabled, the output current should be zero (decaying to zero) so that relay K-1 drops out. However, K-2 has picked up, locking out, and is independent of K-1 thereafter.

C) KILOVOLTMETER AND MILLIAMMETER CIRCUIT:

The operation of these circuits is almost identical. The kilovoltmeter M-1 has in series with it a resistor R-3 which is used to fire the neon lamp I-4 in case of transient surges. Capacitor C-2 is utilized to bypass transients which take place more rapidly than the ionization time of the neon I-4.

Multiplier resistor R-5 is designed to provide a feedback current proportional to output voltage. The kilovoltmeter dial has been calibrated in terms of output voltage, hence true output voltage is read in this fashion.

The milliammeter circuit operates in an analogous fashion, where R-4, C-1 and I-3 perform essentially the same functions as R-3, C-2 and I-4, described above. The neon fires in the event of an overload and bypasses the majority of the overload current and protects the meter M-2.

D) HIGH VOLTAGE POWER PACK:

The high voltage power pack employs solid state rectifiers connected either in a full-wave bridge or in a full-wave voltage doubling circuit (see wiring diagram). There is included inside the pack series resistors to limit discharge currents in the event of short circuit.

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V. SERVICE ACCESS

A) TOP COVER HOOD:

Remove the screws on the sides of the cover. Removing this cover hood gives access to controls and the power pack. If it is desired to drop the front panel, then the screws on the bottom of the front panel should be removed.

B) CHASSIS BOTTOM COVER PLATE:

The reversing assembly as well as the multiplier resistor R-5 is located inside the bottom of the chassis. Removing the four corner screws is a simple matter and allows rapid access.

VI. DRAWINGS AND REPLACEMENT BILL OF MATERIAL

Included in this section are the following:

A) UVC Bulletin T-41-5, entitled "High Voltage Terminations".

B) Wiring Diagram #UVC C-6-1-270

C) Replacement Bill of Material.

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June 1966
Replacement Bill of Material
UVC Model BAP Series (-3 case)

Schem. No.	Part	Description	Qty
C-1,2	Capacitor	0.25 mfd at 200 V	2
C-3	Capacitor-	.25 mfd at 200 V	1
C-4,5	Capacitor	.01 mfd at 1 KV, Centralab "GAPCAP" Z5U	2
F-1,2	Fuse	Type 3AG	
		BAP-6-40: type 3AG, 5 amp	2
		BAP-10-40: type 3AG, 8 amp	2
		BAP-16-10: type 3AG, 3 amp	2
		BAP-16-20: type 3AG, 5 amp	2
		BAP-22-10: type 3AG, 5 amp	2
		BAP-32-5.5: type 3AG, 3 amp	2
		BAP-32-10: type 3AG, 5 amp	2
I-1,2	Lamp	1819	2
I-3-7	Lamp,	NE-2	5
K-1	Overload Relay	Kurman 51CB44D	1
K-2,3	Relay	P&B #KA5AY, 115V coil	2
M-1	Meter, KV	Ideal Prec #250PI, 0-100 micro-amps DC FSS	1
M-2	Meter, MA	Ideal Prec #250PI, 0-1.5 milli-amps DC FSS	1
R-1,2	Resistor	WW, 2.5K, 5W, 10%	2
R-3	Resistor	carbon, 390 K, 1W, 10%	1
R-4A	Resistor	dep carbon, 15K, 1/2W, 1% (in series with R-4B)	1
R-4B	Resistor	Pot, Clarostat U-39-5KΩ	1
R-5	Resistor	matched pair, 2% RPC type BBR per chart below (except BAP-32-5.5 and BAP-32-10, which use RPC type BFQ/BFT - 2%):	

Model	Resistance Total
BAP-6-40:	60 megΩ total
BAP-10-40:	115 megΩ total
BAP-16-10, 16-20:	170 megΩ total
BAP-22-10:	240 megΩ total
BAP-32-5.5, 32-10:	330 megΩ total

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June 1966
Replacement Bill of Material
BAP Series (-3 case)

Schem. No.	Part	Description	Qty
R-6	Resistor	Dep carbon, 1/2W, ±10% per chart below:	
		BAP-10-10, 22-10, 32-10: 3KΩ	1
		BAP-16-20: 1.5KΩ	1
		BAP-6-40, 10-40: RPC CAB 526Ω	1
		BAP-32-5.5: 6KΩ	1
R-7	Resistor	All units except BAP-32-5.5: Pot, 100KΩ, 2 watt, carbon	1
		BAP-32-5.5: Pot, 250 KΩ, 2 watt, carbon	1
R-8	Resistor	BAP-16-10, 22-10, 32-10: Pot 10 K, WW, 2W	1
		BAP-16-20: Pot, 5K, WW, 2W	1
		BAP-16-40, 10-40: Pot, 2K, WW, 2W	1
		BAP-32-5.5, Pot, 50KΩ, WW, 2W	1
R-9	RES.	CARBON 33K, 1W 10%	1
S-1	Switch	SP, ST, 3 amp, 115V, NC Smith 925	1
S-2	Switch	SP, ST, 3 amp, 115V NO Smith 927	1
S-3	Switch	Mallory #3143J	1
S-4	Switch	Microswitch 1115M1-T2	1
S-5	Swifch	Smith #500	1
T-1	Autotran	Staco T51U (250 BUX for BAP-16-10, 32-5.5)	1
PS-1	Power Supply	High Voltage Power Pack BAP-32-5.5 USES AN EPOXY CAST UNIT	

REPLACEMENT BILL OF MATERIAL FOR PS-1 - HV POWER SUPPLY:

C-1,2	Capacitor	Per chart below:	
		MODEL:	
		BAP-6-40: .5mfd @ 3.5KV (3/parallel/leg)	6
		BAP-10-40: .15mfd @7.5KV (5/parallel/leg)	10
		BAP-16-10: .12 mfd @ 12KV (1/leg)	2
		BAP-16-20: .12 mfd @ 12KV (2/parallel/leg)	4
		BAP-22-10: .07mfd @ 15KV (2/parallel/leg)	4
		BAP-32-10: .09mfd @ 10KV (2/series/leg)	4

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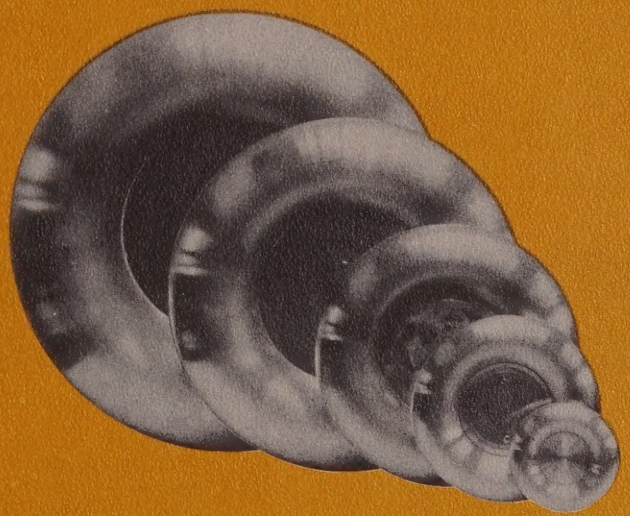
June 1966
Replacement Bill of Material
BAP Series (-3 case)

Schem. No.	Part	Description	Qty
R-1,2	Resistor	Per chart below:	
	BAP-6-40:	10 meg, 2W, carbon, 10% (1/capacitor)	6
	BAP-10-40:	560K, 2W, carbon, 10% (6/series/leg)	12
	BAP-16-10:	1.8 meg, 2W, carbon, 10% (6/series/leg)	12
	BAP-16-20:	1.8 meg, 2W, carbon, 10% (6/series/leg)	12
	BAP-22-10:	2.2 meg, 2W, carbon, 10% (8/series/leg)	16
	BAP-32-10:	RPC BBM, 300 meg, 10% (1/capacitor)	4
R-3,4	Resistor	Per Chart Below:	
	BAP-6-40:	220Ω, 2W, carbon, 10%	2
	BAP-10-40:	~~220Ω, 2W~~, carbon, 10% 500Ω 20W	~~2~~ 1
	BAP-16-10:	2.4 KΩ, 2W, carbon, 10%	2
	BAP-16-20:	1.2KΩ, 2W, carbon, 10%	2
	BAP-22-10:	10KΩ, 10W, WW, 10%, carbon	2
	BAP-32-10:	10KΩ, 10W, WW, 10%, carbon	2
T-1	Transformer	Per Chart below:	
	BAP-6-40	UVC #3-10-56	
	BAP-10-40	UVC #3-1-411	
	BAP-16-10	UVC #3-10-57	
	BAP-16-20	UVC #3-10-57	
	BAP-22-10	UVC #3-10-7	
	BAP-32-10	UVC #3-1-241	
CR-1	Rectifier	Per chart below:	
	BAP-6-40	UVC #B-2-1371-18	3
	BAP-10-40	UVC #B-2-1371-18	5
	BAP-16-10	GI #20,000HA6	4
	BAP-16-20	UVC #B-2-1371-18	7
	BAP-22-10	GI # 7000HA6.5 (4/series, 2/parallel/leg)	16
	BAP-32-10	GI #20000HA.8 (8/series,2/parallel/leg)	8

ıH VOLTAGE TERMINATIONS

Bulletin T—41—5

- MINIMIZE LEAKAGE AND CORONA LOSSES
- PROVIDE PREDICTABLE PERFORMANCE
- PERMIT CLOSER SPACING OF HIGH VOLTAGE COMPONENTS
- INCREASE RELIABILITY
- SIMPLIFY WIRING AND TERMINATION PROBLEMS



UVC High Voltage Terminations have been de-ıed and fabricated specifically for reliability and ıe spacing in high voltage applications. Each of se standard terminations (cap nuts, toroids, and eres) have been manufactured to geometrical con-ırations which have been chosen for their sharply ned corona and leakage onset characteristics. urate machining and polishing, along with adequate l experience on the recommended termination size a given voltage, insures trouble free and reliable rice.

ll items are an outgrowth of development work e by UVC to satisfy their own requirements corona free terminations. These are vital in high age work to reduce generated radio interference, to eliminate the possibility of gradual deteriora-ı of insulation which generally occurs as a result orona fields. (Organic insulators such as varnishes, ds, cellulose, natural rubber, neoprene, etc. are ticularly susceptible).

he predictable performance obtained with UVC ninations, coupled with their low cost and ease of allation, can add greatly to your systems or ducts reliability.

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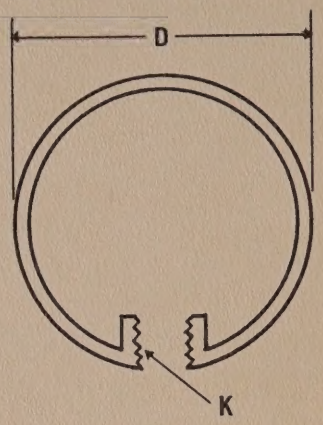
HIGH VOLTAGE LEADERSHIP

HIGH VOLTAGE TERMINATIONS — FO
CORONA PREVENTION AND REDUCTIO

SPHERES

Spheres represent one of the most common techniques for capping stress points and find wide usa as capping devices in virtually all applications, (including sphere gap measurements). Diamet of up to four feet have been used in some installations, and are available on special order.

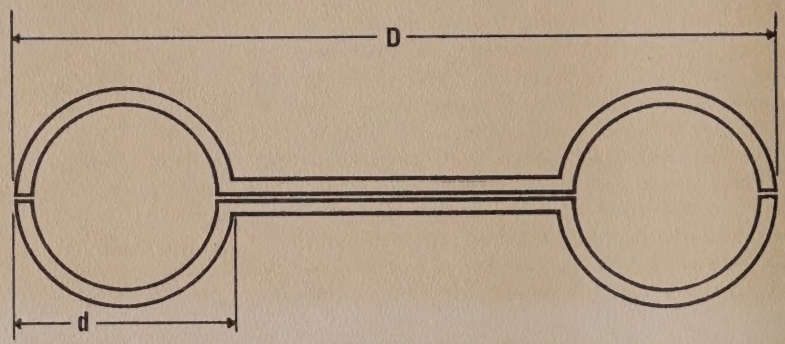
Recommended Operating Voltage* (KV)	Part Number	D (in)	K
10	TS- 10	¼	6-32
20	TS- 20	½	8-32
35	TS- 35	1	10-32
70	TS- 70	2	¼-20
100	TS-100	3	¼-20
130	TS-130	4	¼-20
165	TS-165	5	¼-20
200	TS-200	6	¼-20
250	TS-250	7	¼-20
300	TS-300	8	¼-20
350	TS-350	10	¼-20



TOROIDS

Where space factors are critical, the toroid is often used in lieu of sphere. It is quite common employ them as caps for bushings or as junction points in building up a string of resisto capacitors, etc. They are provided in two parts to make up one toroid. Mounting holes are r provided except on special order, but can be easily added (by the customer) to fit specific nee

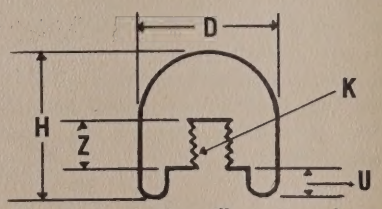
Recommended Operating Voltage* (KV)	Part Number	d (in)	D (in)
30	TT- 30	1	4
60	TT- 60	1¾	7
90	TT- 90	2½	10
120	TT-120	3½	14
150	TT-150	4½	18
200	TT-200	6	24
250	TT-250	7	28
300	TT-300	8½	34
350	TT-350	10	40



CAP NUTS

These are essentially a modification of a sphere and find wide use in lower voltage applicatio (below 50 KV). Their primary advantage is in economy, in that the material is easily machin from bar stock. An undercut permits ease of lug connection, without sacrificing proper coro free characteristics.

Recommended Operating Voltage* (KV)	Part Number	D (in)	H (in)	K	U (in)	Z (in)
15	TC-15	½	⅝	6-32	⅛	5/16
25	TC-25	¾	⅞	10-32	3/16	7/16
35	TC-35	1	1	¼-20	¼	½



*Recommended operating voltage—The recommended operating voltage is defined as that *peak* voltage at which the termination will operate and remain virtually corona free. A twenty percent safety factor has been added to cover normal variations from standard conditions (i.e., a barometric pressure of 760 mm. [sea level] and a temperature of 25°C). Most terminations will operate corona free up to about 5,000 feet.

TECHNICAL CONSIDERATIONS—

A most basic concern of designers of high voltage equipment is the inherent problem of insulation. Carefully designed high vo terminations represent the most fundamental and successful method of eliminating insulation breakdown and corona discharge prob

Basic electrostatic theory shows that sharp points, edges, corners, etc., represent discontinuities in the mapping of equipotentia faces. It is precisely these discontinuities that create unpredictable high voltage performance. Capping these points with a si conducting termination eliminates the high stress points (discontinuities) in favor of a more linear distribution of voltage gradi

By forcing a near uniform operating voltage gradient substantially below the breakdown point of the insulation, a high degr reliable corona free operation is obtained. In this regard, it is somewhat paradoxical to note that to accomplish reliable miniaturiz of a given high voltage installation, one must incorporate what appear as "bulky" terminations.

Re-order by Stock No.
With this center gusset No. 577
Plain — without gusset No. 575
Amfile®